MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

ECP2056 – DATA COMMUNICATIONS AND COMPUTER NETWORKING

(RE/TE)

12 MARCH 2020
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of 4 pages including cover page with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) Discuss the difference between a point-to-point connection and a multipoint connection.

[2 + 2 marks]

(b) Classify and describe types of data flow for the following applications:
(i) FM radio signal from radio station

[3 marks]

(ii) Telephone

[3 marks]

(iii) Walkie-talkie

[3 marks]

(c) Computer A and Computer B are connected via two routers (R1 and R2), as shown in Figure Q1(c). Draw a diagram to illustrate the interaction between layers in the TCP/IP protocol suite, and the flow of data when these two computers exchange messages.

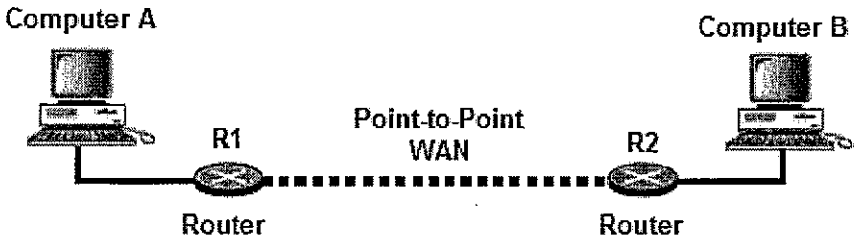

Figure Q1(c)

[6 marks]

(d) Match the following with one of the layers from TCP/IP protocol suite:
(i) Host-to-host communications

[1 mark]

(ii) Transmission of bit stream across physical medium

[1 mark]

(iii) Flow control

[1 mark]

(iv) Compression and encryption

[1 mark]

(v) Reliable end-to-end data transportation

[1 mark]

(vi) Route determination

[1 mark]

Continued...

Question 2

(a) An asynchronous transmission system is using one start bit, eight data bits, two stop bits, and one parity bit. Calculate the total bit rate and useful information transfer rate in bps if two bits per signaling element is used and the signaling rate is 300 Baud.

[3 + 3 marks]

(b) Define attenuation and distortion in transmission impairment.

[2 + 2 marks]

(c) Draw a digital signal of a data stream **10001011** with the encoding below:

(i) NRZ-I

[4 marks]

(ii) Differential Manchester

[4 marks]

(d) A multiplexer has four sources, each creating 250 characters per second. If each character has 8 bits:

(i) Find the duration of each character and the data rate in bps.

[2 marks]

(ii) If the interleaved unit is a character and 1 synchronizing bit is added to each frame, find duration of a frame, and the data rate of the link.

[2 marks]

(iii) If the interleaved unit is two characters and no synchronizing bit is needed, find the duration of each frame, and the data rate of the link.

[3 marks]

Question 3

(a) A bit sequence 1100111010_2 is sent through a link with cyclic redundancy check (CRC) error detection scheme using the generator polynomial of $X^4 + X^2 + 1$.

(i) Determine the 4-bit CRC and the codeword.

[6 marks]

(ii) Prove that if the receiver received a codeword sequence of 11101100100111_2, it will detect 2-bit errors.

[6 marks]

(b) A series of packets are transmitted to a common destination using an 8-bit sequence numbers. If this sequence begins with 0, determine the:

(i) range of sequence number;

[2 marks]

(ii) sequence number after sending 350 packets;

[2 marks]

Continued...

(iii) maximum sizes of the send and receive windows for Stop-and-Wait ARQ;
[2 marks]

(iv) maximum sizes of the send and receive windows for Go-Back-N ARQ;
[2 marks]

(v) maximum sizes of the send and receive windows for Selective Repeat ARQ.
[2 marks]

(c) Consider ACK6 has been received by the sender in a Go-Back N sliding window system. If frames 6,7,0,1 and 2 are sent, for a different scenario, discuss the significance of receiving ACK0 and ACK3.
[3 marks]

Question 4

(a) Describe **FOUR (4)** reasons of dividing one Local Area Network (LAN) into multiple LANs.
[2 + 2 + 2 + 2 marks]

(b) A 4 km baseband bus has a number of equally spaced stations, each having a data rate of 200 Mbps.

(i) Calculate the total time required to send a frame of 6,000 bits from a bus-end station A to another bus-end station B. Assume propagation speed is 200 m/μs.
[3 marks]

(ii) If station B starts to transmit at exactly the same time when the signal from station A arrives, their signal will interfere with each other and time is wasted in delivering these corrupted frames. Calculate time wasted in delivering the corrupted frames. Also, determine the time wasted at station A for CSMA and CSMA/CD access methods (jam signals and backoff time are excluded).
[4 marks]

(c) What are the **TWO (2)** benefits of implementing subnets?
[2 + 2 marks]

(d) A company has a network with Internet Protocol (IP) address of 130.122.34.7 and subnet mask of 255.255.255.192.

(i) How many subnets are there in the network?
[3 marks]

(ii) What is the maximum number of hosts supported by each subnet?
[3 marks]

End of Paper